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mutual relation of such, particles. But the theories attributing the determination of the elements to the attractions and repulsions of the poles require no such condition, *i.e.* there is no reason apparent why the attraction of the positive pole,, and the repulsion of the negative pole,, upon a particle of free acid, placed in water between them, should not (with equal currents of electricity) be as strong as if that particle were previously combined with alkali; but, on the contrary, as they have not a powerful chemical affinity to overcome, there is every reason to suppose they would be stronger, and would sooner bring the acid to rest at the positive pole.¹ Yet such is not the case, as has been shown by the experiments on free and combined acid (262, 264).

279. Neither does M. de la Rive's theory, as I understand it, require that the particles should be in combination: it does not even admit, where there are two sets of particles capable of combining with and passing by each other, that they do combine, but supposes that they travel as separate compounds of matter and electricity. Yet in fact the free substance *cannot* travel, the combined one *can*.

280. It is very difficult to find cases amongst solutions or fluids which shall illustrate this point, because of the difficulty of finding two fluids which shall conduct, shall not mingle and in which an element evolved from one shall not find a com-

¹ binable element in the other. *Solutions* of acids or alkalies will not answer, because they exist by virtue of an attraction; and increasing the solubility of a body in one direction, and diminishing it in the opposite, is just as good a reason for transfer as modifying the affinity between the acids and alkalies themselves.²

Nevertheless the case of sulphate of magnesia is in point (230, 231), and shows that *one element or principle only*

| ! has no power of transference or of passing towards either pole.

* ! 281. Many of the metals, however, in their solid state, offer very fair instances of the kind required.

¹ Thus, if a plate of platina be used as the positive pole in a solution of sulphuric

acid, oxygen will pass towards it, and so will acid; but these

¹ | are not substances having such chemical relation to the platina

as, even under the favourable condition
 ^ i current (254, 260), to combine with it;
 > | remains where it was first placed, and has no
 tendency to pass

) i ¹ Even Sir Humphry Davy considered the
 attraction of the pole as being
 s 1 communicated from one particle to another of the
 same kind (219).
² See the note to 410.—December 1838.